Trend Study 30-13-03

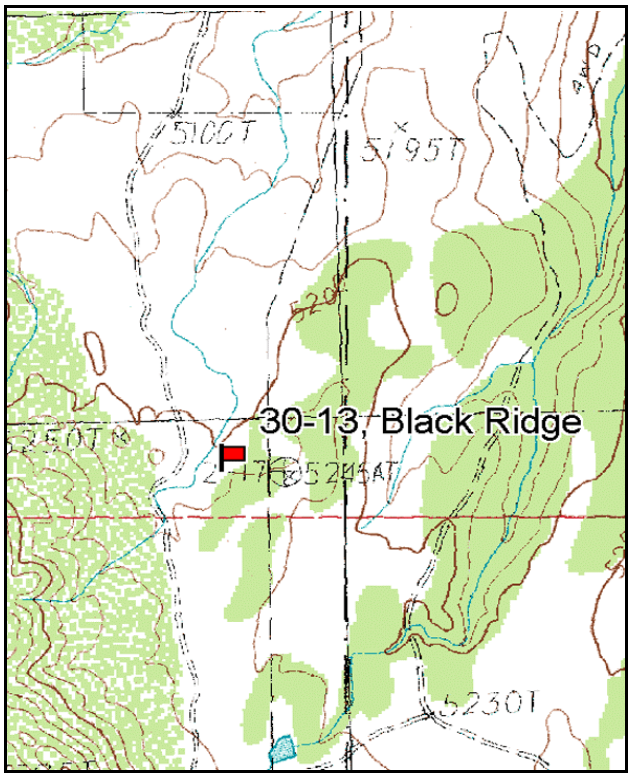
Study site name: Black Ridge . Vegetation type: Chained, seeded P-J .

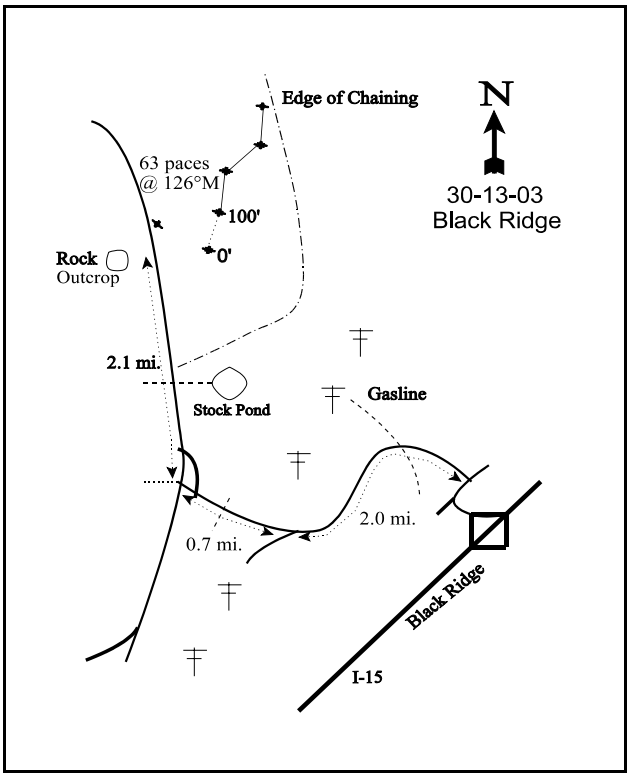
Compass bearing: frequency baseline 2 degrees magnetic.

Frequency belt placement: line 1 (15 & 84ft), line 2 (34ft), line 3 (59ft), line 4 (71ft). No rebar.

LOCATION DESCRIPTION

Traveling south on I-15 from Cedar City, take the Black Ridge exit (exit #36). Go west for a short distance to a frontage road. Turn north (right) on the frontage road and then take the first left turn heading west. Travel approximately 2.0 miles on this road going south and passing a corral, disregarding minor turnoffs. At this point, you will come to an intersection at the power lines. Take the road to the right. Proceed on this road for another 0.7 miles, at which point there will be another intersection. Turn right at the intersection and travel 2.1 miles, then stop. On the left side of the road is a large rock outcrop. On the right side of the road is a witness post. The 0-foot baseline stake is located 63 paces at a bearing of 126 degrees magnetic from the witness post. The study is marked by green steel "T" fence posts approximately 18 to 24 inches in height. The 0-foot baseline stake is marked with a browse tag #7003.





Map Name: New Harmony

Diagrammatic Sketch

Township 39S , Range 13W , Section 2

GPS: NAD 27, UTM 12S 4143873 N, 298732 E

DISCUSSION

Black Ridge - Trend Study No. 30-13

This trend study is located on a chained and seeded pinyon-juniper site slightly north of the Great Basin-Colorado River divide on Black Ridge. Elevation is approximately 5,200 feet, with a 8-10% slope and a north aspect. This area has been critical winter range for deer in the past, but currently receives little use because of low deer populations in the area. Cattle were observed in the area during the 1992 reading. Pellet group data taken on the site estimated 21 deer days use/acre in 1998 (52 ddu/ha) and 19 deer days use/acre in 2003 (47 ddu/ha). No sign of cattle use was encountered within the vicinity of the transect in 1998 or 2003.

Soils are igneous in origin, dark-colored, shallow in places, and very rocky. Surface temperatures would likely be high during the summer, especially on the south and west aspects. The soil is actually quite deep once you get past the rocky surface. Effective rooting depth is estimated at 24 inches. Soil texture is a clay loam which is moderately acidic (pH 6.0). Phosphorus is low at just 4.2 ppm, when 10 ppm is considered to be the minimum for normal plant development. Soil temperature is high averaging 73°F at a depth of over 15 inches. There has been erosion occurring on the site in the past as evidenced by the presence of gullies and fairly extensive areas of rock and erosion pavement. However, erosion appears to be controlled since the chaining treatment. Protective ground cover is abundant leaving little bare soil exposed.

This chaining is becoming increasingly dominated by shrubs and trees. During the 1982 reading, browse was not abundant on the site. Mountain big sagebrush (599 plants/acre) and Utah serviceberry (333 plants/acre) were the most common. Sagebrush on the site appears to by a hybrid between black sagebrush (*Artemisia nova*) and mountain big sagebrush (*A. tridentata vaseyana*). However, all sagebrush has been classified as mountain big sagebrush. Mountain big sagebrush increased 94% by 1992 to 10,199 plants/acre. Seedlings were abundant and young plants accounted for 61% of the population. The much larger sample size used in 1998 estimated 6,080 plants/acre. The change in density came mostly from the young age class which declined from 6,266 to 1,940 plants/acre. Density of mature plants remained comparable, and seedlings were still abundant. Sagebrush density increased 15% in 2003 to 7,120 plants/acre. The population is mostly lightly browsed and in good vigor. No seedlings were counted in 2003 and young plants have declined in number although they are still numerous enough to indicate an expanding population.

Serviceberry is scattered throughout the site at a density of just over 100 plants/acre. Mature shrubs average nearly 4 feet in height, and utilization is mostly light. Another preferred species, antelope bitterbrush, also occurs in limited numbers. It shows moderate to heavy use. Small populations of Gambel and shrub-live oak also occur on the site. The increaser, broom snakeweed, appeared in the density plots for the first time in 1992. Density was estimated at 2,066 plants/acre with an equal number of seedlings. By 1998, the number of broom snakeweed increased to 3,240 plants/acre. The population declined by 68% in 2003 due to drought conditions.

Juniper and pinyon trees are abundant and regaining dominance on this site. Point-quarter data from 2003 estimated 104 juniper trees/acre with an average basal diameter of 6.6 inches. Total line-intercept canopy cover was estimated at 12% in 2003. A photo point comparison between readings suggests that juniper has increased significantly in size since the first reading.

Seeded and native grasses are well established on the site even though they have steadily declined in abundance since 1992. Crested wheatgrass dominates with lesser amounts of mutton bluegrass and prairie junegrass. Forbs are diverse, although not particularly numerous. Yellow sweetclover was the only seeded forb encountered during any reading. It has persisted on the site and is one of the most abundant forbs. Other common native perennials include sego lily, thistle, low fleabane and sulfur eriogonum.

1982 APPARENT TREND ASSESSMENT

Soil trend appears to be slowly improving as the site becomes progressively more densely vegetated. There is soil movement and active gully formation, but this appears to be stabilizing. Vegetative trend is more difficult to gauge. The three key browse species appear to be expanding, but may be inhibited somewhat by the more rapid expansion and growth of crested wheatgrass and Utah juniper. The abundance of broom snakeweed should also be closely monitored.

1992 TREND ASSESSMENT

Soil trend is slightly down. Basal vegetative cover dropped 44% since 1982, while bare ground increased slightly. Litter cover also declined from 57% to 44%, likely due to the decrease in grass litter buildup. The browse trend has improved with increased densities of mountain big sagebrush. However, the density of broom snakeweed also increased and has an age class structure indicating an expanding population. The herbaceous trend is difficult to determine by looking solely at the data. Quadrat frequency of both grasses and forbs have increased. However, by looking at the photos it is apparent that grasses have declined in stature and vigor. If this trend continues it will result in a shrub and tree dominated system. Trend for herbaceous understory is therefore, slightly down.

TREND ASSESSMENT
soil - slightly down (2)
browse - up (5)
herbaceous understory - down slightly (2)

1998 TREND ASSESSMENT

Trend for soil is stable since 1992. Percent bare ground declined slightly even though litter cover also went downward. Rock and pavement cover increased from 41% to 52%. However, soil erosion appears to be under control. Trend for the key browse species, mountain big sagebrush appears stable. Density has declined due to a reduction in young plants which were very abundant in 1992. Density of mature plants has remained similar between readings. There are still ample seedlings and young to maintain the population. Utilization is mostly light and vigor good. Percent decadence has increased, but it is still low at 11%. Broom snakeweed has increased 36% since 1992. However, the current population is mostly mature. Juniper density is similar to 1992 estimates, while trees have greatly increased in size. Currently, overhead canopy cover averages 5%. Trend for the herbaceous understory is mixed. Sum of nested frequency for perennial grasses has remained steady, although frequency of perennial forbs has increased. Nested frequency of crested wheatgrass declined significantly. Overall, trend is considered stable since grasses provide most of the herbaceous cover.

TREND ASSESSMENT
soil - stable (3)
browse - stable (3)
herbaceous understory - stable (3)

2003 TREND ASSESSMENT

Trend for soil is considered down slightly due to a decline in total protective ground cover and an increase in cover of bare ground, yet erosion does not appear to be a problem currently. Trend for the key browse species, mountain big sagebrush, is considered stable. Density has increased 15% since 1998 to 7,120 plants/acre. Utilization remains mostly light, vigor normal, and percent decadence low at 18%. It appears that the rapid expansion of sagebrush has slowed on this site. No seedlings were encountered in 2003, but young

plants are still numerous and more than enough to maintain the current population. Drought conditions for the past several years in this area has also helped slow expansion of sagebrush. Drought conditions are also a factor in the 68% decline of broom snakeweed. One negative aspect of the browse trend is the increase in density and size of juniper trees. Average canopy cover of juniper has more than doubled since 1998 (5% to 12%). The rapid expansion of shrubs and trees on this site, in addition to drought has resulted in a downward trend for the herbaceous understory. The rocky nature of the soil surface also gives shrubs and trees a competitive advantage over grasses. The primary seeded grass, crested wheatgrass, has declined significantly with each reading. All other grasses sampled in 2003 also have declining nested frequency values. Average cover of grasses has fallen threefold since 1998 (12% to 4%), while forb cover has declined more than twofold (17% to 7%). A return to normal precipitation patterns would do much to reverse this trend but a retreatment of surviving juniper trees on this old chaining would also improve conditions.

TREND ASSESSMENT
soil - down slightly (2)
browse - stable (3)
herbaceous understory - down (1)

HERBACEOUS TRENDS --
Management unit 30 , Study no: 13

Type	Species	Nested Frequency			Average Cover %	
		'92	'98	'03	'98	'03
G	Agropyron cristatum	$_{c}$249	$_{b}$192	$_{a}$106	5.53	1.84
G	Agropyron intermedium	3	3	-	.03	-
G	Bromus tectorum (a)	-	$_{b}$113	$_{a}$53	1.32	.20
G	Elymus junceus	$_{b}$10	$_{a}$3	$_{a}$-	.03	-
G	Koeleria cristata	$_{a}$26	$_{b}$63	$_{a}$31	2.53	.43
G	Poa fendleriana	47	58	30	2.14	1.50
G	Poa secunda	-	4	-	.06	-
G	Sitanion hystrix	$_{b}$32	$_{ab}$17	$_{a}$7	.33	.33
G	Vulpia octoflora (a)	-	11	11	.05	.07
Total for Annual Grasses		0	124	64	1.37	0.27
Total for Perennial Grasses		367	340	174	10.67	4.11
Total for Grasses		367	464	238	12.05	4.38
F	Agoseris glauca	$_{a}$-	$_{b}$18	$_{a}$-	.12	-
F	Antennaria rosea	3	-	-	-	-
F	Arabis spp.	2	4	-	.01	-
F	Artemesia biennis	1	-	-	-	-
F	Aster spp.	2	5	3	.04	.03
F	Astragalus spp.	-	7	2	.09	.00
F	Balsamorhiza hookeri	2	-	-	-	.03
F	Calochortus nuttallii	$_{a}$-	$_{b}$20	$_{ab}$5	.05	.01
F	Cirsium calcareum	$_{a}$4	$_{b}$17	$_{ab}$13	.49	.63

Type	Species	Nested Frequency			Average Cover %	
		'92	'98	'03	'98	'03
F	Comandra pallida	-	-	2	-	.00
F	Collinsia parviflora (a)	$_{b}$43	$_{a}$17	$_{a}$7	.05	.01
F	Cordylanthus spp. (a)	-	$_{b}$80	$_{a}$44	.56	.72
F	Crepis acuminata	-	-	2	-	.15
F	Crepis occidentalis	1	-	-	-	-
F	Descurainia pinnata (a)	-	-	3	-	.03
F	Draba spp. (a)	-	$_{b}$30	$_{a}$12	.15	.03
F	Epilobium brachycarpum (a)	-	$_{b}$29	$_{a}$-	.06	-
F	Erigeron pumilus	$_{a}$2	$_{b}$34	$_{a}$4	.24	.03
F	Eriogonum racemosum	$_{a}$-	$_{a}$-	$_{b}$13	-	.07
F	Eriogonum umbellatum	$_{a}$15	$_{b}$40	$_{a}$17	.65	.13
F	Lithospermum spp.	-	4	4	.03	.06
F	Lomatium spp.	-	7	9	.02	.02
F	Lupinus argenteus	$_{a}$-	$_{b}$12	$_{a}$-	.19	-
F	Melilotus officinalis	$_{a}$28	$_{b}$60	$_{a}$23	1.88	.33
F	Microsteris gracilis (a)	-	$_{a}$13	$_{b}$73	.04	.63
F	Phlox longifolia	-	6	9	.01	.04
F	Polygonum douglasii (a)	-	$_{b}$14	$_{a}$-	.03	-
F	Ranunculus spp.	-	$_{b}$54	$_{a}$-	.22	-
F	Sphaeralcea grossulariaefolia	-	-	3	-	.00
F	Tragopogon dubius	1	-	-	-	-
F	Viguiera multiflora	$_{b}$35	$_{a}$5	$_{a}$-	.18	-
F	Zigadenus paniculatus	-	3	3	.01	.03
Total for Annual Forbs		43	183	139	0.90	1.43
Total for Perennial Forbs		96	296	112	4.27	1.61
Total for Forbs		139	479	251	5.17	3.04

Values with different subscript letters are significantly different at alpha = 0.10

BROWSE TRENDS --
Management unit 30 , Study no: 13

Type	Species	Strip Frequency '98	Strip Frequency '03	Average Cover % '98	Average Cover % '03
B	Amelanchier utahensis	5	4	1.08	1.54
B	Artemisia tridentata vaseyana	89	89	14.92	13.55
B	Chrysothamnus nauseosus hololeucus	1	0	-	-
B	Gutierrezia sarothrae	41	24	1.74	.43
B	Juniperus osteosperma	14	17	3.59	8.79
B	Opuntia spp.	2	2	-	-
B	Purshia tridentata	1	2	.15	-
B	Quercus gambelii	3	4	1.41	.45
B	Quercus turbinella	1	2	.38	.53
Total for Browse		157	144	23.30	25.29

CANOPY COVER, LINE INTERCEPT --
Management unit 30 , Study no: 13

Species	Percent Cover '98	Percent Cover '03
Amelanchier utahensis	-	1.41
Artemisia tridentata vaseyana	-	16.33
Gutierrezia sarothrae	-	.35
Juniperus osteosperma	5.00	11.80
Opuntia spp.	-	.03
Pinus monophylla	.60	.63
Purshia tridentata	-	.38
Quercus gambelii	-	1.68

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 30 , Study no: 13

Species	Average leader growth (in) '03
Amelanchier utahensis	1.4
Artemisia tridentata vaseyana	3.1

POINT-QUARTER TREE DATA --
Management unit 30 , Study no: 13

Species	Trees per Acre	
	'98	'03
Juniperus osteosperma	90	104
Pinus monophylla	6	-

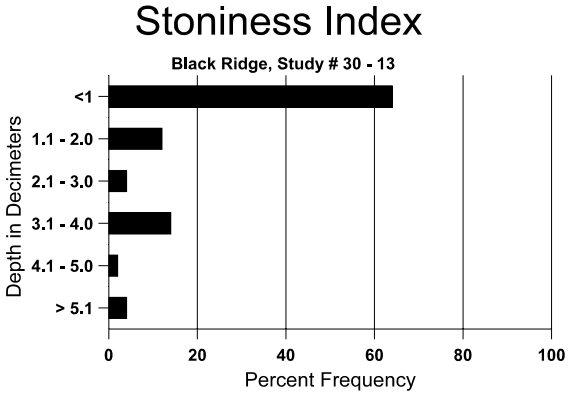
Average diameter (in)	
'98	'03
3.8	6.6
4.0	-

BASIC COVER --
Management unit 30 , Study no: 13

Cover Type	Average Cover %		
	'92	'98	'03
Vegetation	6.75	36.18	30.42
Rock	34.50	40.43	35.95
Pavement	6.00	11.23	5.14
Litter	44.00	39.61	38.73
Cryptogams	.75	.32	.19
Bare Ground	8.75	6.98	10.60

SOIL ANALYSIS DATA --
Management unit 30, Study no: 13, Study Name: Black Ridge

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	ds/m
24.2	72.5 (15.2)	6.0	32.0	33.4	34.6	2.1	4.2	76.8	0.5



PELLET GROUP DATA --
Management unit 30 , Study no: 13

Type	Quadrat Frequency	
	'98	'03
Rabbit	12	12
Deer	18	4

Days use per acre (ha)	
'98	'03
-	-
21 (52)	19 (46)

BROWSE CHARACTERISTICS --
Management unit 30 , Study no: 13

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
Amelanchier utahensis											
82	**333**	-	-	333	-	-	20	0	0	0	11/18
92	**133**	-	133	-	-	-	0	0	0	0	-/-
98	**1140**	-	380	760	-	-	2	0	0	0	41/45
03	**120**	-	40	60	20	-	17	0	17	0	47/53
Artemisia tridentata vaseyana											
82	**599**	-	133	466	-	-	0	0	0	0	14/25
92	**10199**	5466	6266	3800	133	-	7	0	1	.65	14/18
98	**6080**	2360	1940	3480	660	200	12	0	11	7	19/31
03	**7120**	-	780	5060	1280	380	14	0	18	6	20/25
Chrysothamnus nauseosus hololeucus											
82	**0**	-	-	-	-	-	0	0	0	0	-/-
92	**0**	-	-	-	-	-	0	0	0	0	-/-
98	**40**	-	-	-	40	-	0	0	100	100	-/-
03	**0**	-	-	-	-	-	0	0	0	0	-/-
Gutierrezia sarothrae											
82	**0**	-	-	-	-	-	0	0	0	0	-/-
92	**2066**	2733	400	1666	-	-	0	0	0	0	9/9
98	**3240**	-	500	2660	80	20	0	0	2	.61	6/8
03	**1040**	-	20	900	120	20	0	0	12	6	8/8
Juniperus osteosperma											
82	**799**	-	133	666	-	-	0	0	0	0	47/27
92	**333**	66	133	200	-	-	0	0	0	0	30/62
98	**320**	-	120	200	-	20	0	0	0	0	-/-
03	**420**	-	80	300	40	-	0	0	10	0	-/-
Opuntia spp.											
82	**0**	-	-	-	-	-	0	0	-	0	-/-
92	**132**	-	66	66	-	-	0	0	-	0	11/17
98	**40**	-	-	40	-	-	0	0	-	0	4/3
03	**60**	-	-	60	-	-	0	0	-	0	6/9
Purshia tridentata											
82	**0**	-	-	-	-	-	0	0	-	0	-/-
92	**0**	-	-	-	-	-	0	0	-	0	-/-
98	**20**	-	-	20	-	-	100	0	-	0	12/100
03	**60**	-	-	60	-	-	0	67	-	0	16/34

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
Quercus gambelii											
82	**133**	-	133	-	-	-	0	0	-	0	-/-
92	**0**	-	-	-	-	-	0	0	-	0	-/-
98	**140**	-	-	140	-	40	0	0	-	0	60/41
03	**220**	-	120	100	-	40	0	0	-	0	39/24
Quercus turbinella											
82	**0**	-	-	-	-	-	0	0	-	0	-/-
92	**0**	-	-	-	-	-	0	0	-	0	-/-
98	**200**	-	-	200	-	-	0	0	-	0	61/28
03	**160**	-	-	160	-	-	0	0	-	0	62/11